Operating Instructions

KSR-TF 633

with transistor output

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1 About this document

1.1 Function

This operating instructions manual provides all the information you need for mounting, connection and setup as well as important instructions for maintenance and fault rectification. Please read this information before putting the instrument into operation and keep this manual accessible in the immediate vicinity of the device.

1.2 Target group

This operating instructions manual is directed to trained personnel. The contents of this manual should be made available to these personnel and put into practice by them.

1.3 Symbolism used

Information, tip, note
This symbol indicates helpful additional information.

Caution: If this warning is ignored, faults or malfunctions can result.
Warning: If this warning is ignored, injury to persons and/or serious damage to the instrument can result.
Danger: If this warning is ignored, serious injury to persons and/or destruction of the instrument can result.

Ex applications
This symbol indicates special instructions for Ex applications.

- **List**
The dot set in front indicates a list with no implied sequence.

→ **Action**
This arrow indicates a single action.

1 **Sequence**
Numbers set in front indicate successive steps in a procedure.

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2 For your safety

2.1 Authorised personnel

All operations described in this operating instructions manual must be carried out only by trained specialist personnel authorised by the operator.

During work on and with the device the required personal protection equipment must always be worn.

2.2 Appropriate use

KSR-TF 633 is a sensor for level detection.

You can find detailed information on the application range in chapter "*Product description*".

2.3 Warning about misuse

Inappropriate or incorrect use of the instrument can give rise to application-specific hazards, e.g. vessel overfill or damage to system components through incorrect mounting or adjustment.

2.4 General safety instructions

This is a high-tech instrument requiring the strict observance of standard regulations and guidelines. The user must take note of the safety instructions in this operating instructions manual, the country-specific installation standards as well as all prevailing safety regulations and accident prevention rules.

The instrument must only be operated in a technically flawless and reliable condition. The operator is responsible for trouble-free operation of the instrument.

The user is also obliged to determine, during the entire duration of use, the compliance of the necessary occupational safety measures with the current valid regulations and take note of new regulations.

2.5 CE conformity

KSR-TF 633 is in CE conformity with EMC (89/336/EWG), fulfils NAMUR recommendation NE 21 and is in CE conformity with LVD (73/23/EWG).

Conformity has been judged according to the following standards:

- EMC:
  - Emission EN 61326/A1: 1998 (class B)
  - Susceptibility EN 61326: 1997/A1:1998
- LVD: EN 61010-1: 1993

2.6 SIL conformity

KSR-TF 633 fulfills the requirements to functional safety according to IEC 61508 or IEC 61511. You find further information in the Safety Manual.

2.7 Safety instructions for Ex areas

Please note the Ex-specific safety information for installation and operation in Ex areas. These safety instructions are part of the operating instructions manual and come with the Ex-approved instruments.

3 Product description

3.1 Configuration

Scope of delivery

The scope of delivery encompasses:

- KSR-TF 633 level sensor
- Documentation
  - this operating instructions manual
  - Additional instructions manual "*Safety Manual - Functional safety according to IEC 61508 (SIL)*"
  - Ex-specific "*Safety instructions*" (with Ex-versions)
  - if necessary, further certificates

Components

KSR-TF 633 consists of the following components:

- Housing cover
- Housing with electronics
- process fitting with tuning fork

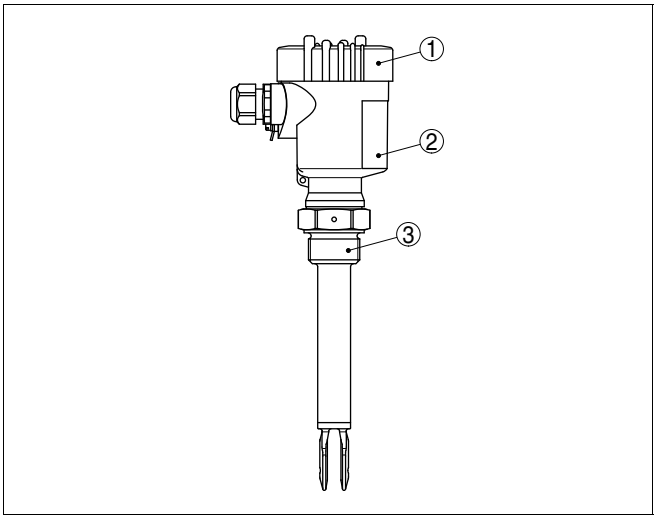

Fig. 1: KSR-TF 633
1 Housing cover
2 Housing with electronics
3 Process fitting

3.2 Principle of operation

Area of application

KSR-TF 633 is a level sensor with tuning fork for level detection.

It is designed for industrial use in all areas of process technology and can be used in liquids.

Typical applications are overfill and dry run protection. With a tuning fork of only 40 mm length, KSR-TF 633 can be also mounted, e.g. in pipelines from DN 25. The small tuning fork allows use in vessels, tanks and pipes. Thanks to its simple and robust measuring system, KSR-TF 633 is virtually unaffected by the chemical and physical properties of the liquid.

It functions even under difficult conditions such as turbulence, air bubbles, foam generation, buildup, strong external vibration or changing products.

Fault monitoring
The electronics module of KSR-TF 633 continuously monitors via frequency evaluation the following criteria:

- Strong corrosion or damage on the tuning fork
- loss of vibration
- Line break to the piezo drive

If a malfunction is detected or in case of power failure, the electronics takes on a defined switching condition, i.e. the output transistor blocks (safe condition).

Functional principle

The tuning fork is piezoelectrically energised and vibrates at its mechanical resonance frequency of approx. 1200 Hz. The piezos are fixed mechanically and are hence not subject to temperature shock limitations. The frequency changes when the tuning fork is covered by the medium. This change is detected by the integrated oscillator and converted into a switching command.

Supply

KSR-TF 633 is a compact instrument, i.e. it can be operated without external evaluation system. The integrated electronics evaluates the level signal and outputs a switching signal. With this switching signal, a connected device can be operated directly (e.g. a warning system, a PLC, a pump etc.).

The data for power supply are stated in chapter "*Technical data*" in the "*Supplement*".

3.3 Operation

With the factory setting, products with a density >0.07 g/cm^3 (>0.025 lbs/in^3) can be measured. The instrument can be adapted if products with lower density should be measured.

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On the electronics module you will find the following indicating and adjustment elements:

- signal lamp for indication of the switching condition (green/ red)
- DIL switch for sensitivity adjustment
- Mode switch for selection of the switching condition (A/B)

3.4 Storage and transport

Packaging

Your instrument was protected by packaging during transport. Its capacity to handle normal loads during transport is assured by a test according to DIN EN 24180.

The packaging of standard instruments consists of environment-friendly, recyclable cardboard. In addition, the sensor is provided with a protective cover of ABS. For special versions PE foam or PE foil is also used. Dispose of the packaging material via specialised recycling companies.

Storage and transport temperature

- Storage and transport temperature see "*Supplement - Technical data - Ambient conditions*"
- Relative humidity 20 … 85 %

4 Mounting

4.1 General instructions

Switching point

In general, KSR-TF 633 can be mounted in any position. The instrument must be mounted in such a way that the tuning fork is at the height of the requested switching point.

The tuning fork has lateral markings (notches) that indicate the switching point with vertical mounting. The switching point refers to water with the basic setting of the sensitivity switch ≥0.7 g/cm³ (0.025 lbs/in³). When mounting KSR-TF 633, make sure that this marking is at the height of the requested switching point. Keep in mind that the switching point of the instrument is shifted if the medium has a density other than water - water 1 g/cm³ (0.036 lbs/in³). For products <0.7 g/cm³ (0.025 lbs/in³) and >0.5 g/cm³ (0.018 lbs/in³) the density switch must be set to ≥0.5 g/cm³.

Keep in mind that foams with a density >0.45 g/cm³ (0.016 lbs/in³) are detected by the sensor. This can cause faulty switchings particulary when used as dry run protection system.

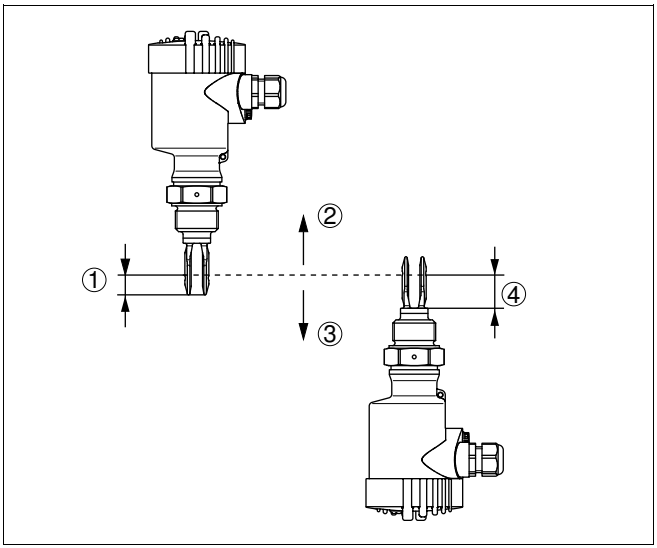

Fig. 2: Vertical mounting
1 Switching point approx. 13 mm (0.51 in)
2 Switching point with lower density
3 Switching point with higher density
4 Switching point approx. 27 mm (1.06 in)

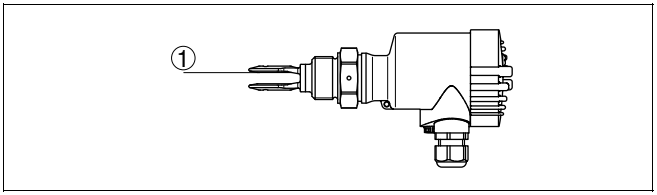

Fig. 3: Horizontal mounting
1 Switching point

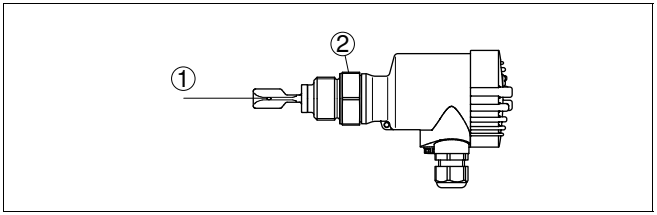

Fig. 4: Vertical installation (recommended installation position, especially for adhesive products)
1 Switching point
2 Marking with screwed version on top, with flange versions directed to the flange holes

With flange versions, the fork is directed as follows to the flange holes.

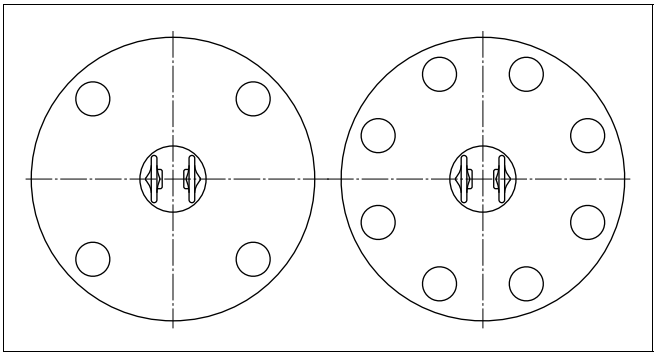

Fig. 5: Fork position with flange versions

Moisture

Use the recommended cables (see chapter "*Connecting to power supply*") and tighten the cable gland.

You can give your KSR-TF 633 additional protection against moisture penetration by leading the connection cable downward in front of the cable entry. Rain and condensation water

can thus drain off. This applies mainly to mounting outdoors, in areas where moisture is expected (e.g. by cleaning processes) or on cooled or heated vessels.

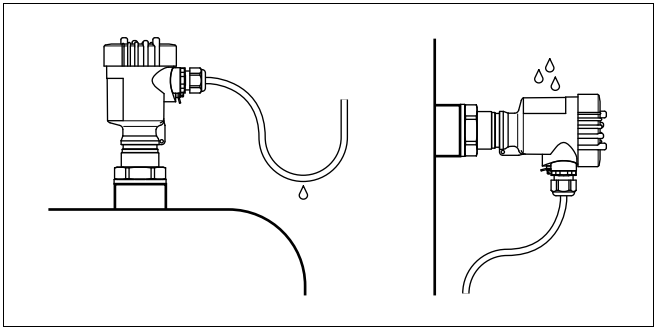

Fig. 6: Measures against moisture penetration

Transport

Do not hold KSR-TF 633 on the tuning fork. Particularly with flange or tube versions, the tuning fork can be damaged just by the weight of the instrument. Transport coated instruments very carefully and avoid touching the tuning fork.

Remove the protective cover just before mounting.

Pressure/Vacuum

The process fitting must be sealed if there is gauge or low pressure in the vessel. Before use, check if the seal material is resistant against the measured product and the process temperature.

The max. permissible pressure is stated in chapter "*Technical data*" in the "*Supplement*" or on the type label of the sensor.

Handling

The vibrating level switch is a measuring instrument and must be treated accordingly. Bending the vibrating element will destroy the instrument.

Warning:
The housing must not be used to screw the instrument in! Applying tightening force on the housing can damage its rotational mechanical parts.

To screw in, use the hexagon above the thread.

4.2 Mounting instructions

Welded socket

KSR-TF 633 has a defined thread starting point. This means that every KSR-TF 633 is in the same fork position after being screwed in. Remove therefore the supplied seal from the thread of KSR-TF 633. This seal is not required when using a welded socket with O-ring in front.

Keep in mind that this welded socket is not suitable for coated instrument versions.

Screw KSR-TF 633 completely into the welded socket. The later position can be determined already before welding. Mark the appropriate position of the welded socket. Before welding, unscrew KSR-TF 633 and remove the rubber ring from the welded socket. The welded socket has a marking (notch). Weld the socket with the notch facing upward, or in case of pipelines, aligned with the direction of flow.

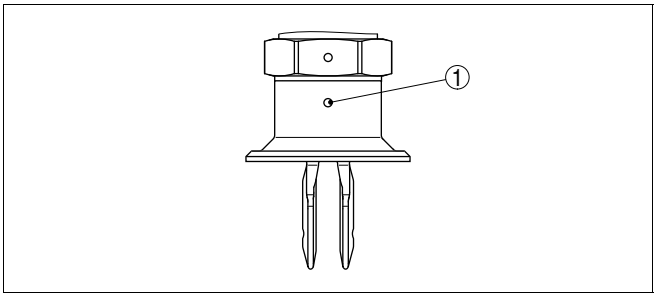

Fig. 7: Marking on the welded socket
1 Marking

Adhesive products

In case of horizontal mounting in adhesive and viscous products, the surfaces of the tuning fork should be vertical in order to reduce buildup on the tuning fork. On the screwed version you will find a marking on the hexagon. With this, you can check the position of the tuning fork when screwing it in. When the hexagon touches the seal, the thread can still be turned by approx. half a turn. This is sufficient to reach the recommended installation position.

With flange versions, the fork is directed to the flange holes.

When used in adhesive and viscous products, the tuning fork should protrude into the vessel to avoid buildup. For that reason, sockets for flanges and mounting bosses should be avoided when mounting horizontally.

Inflowing medium

If KSR-TF 633 is mounted in the filling stream, unwanted mismeasurements may result. Mount KSR-TF 633 at a location in the vessel where no disturbing influence from e.g. filling openings, agitators, etc. can occur.

This applies particularly to instrument types with long extension tube.

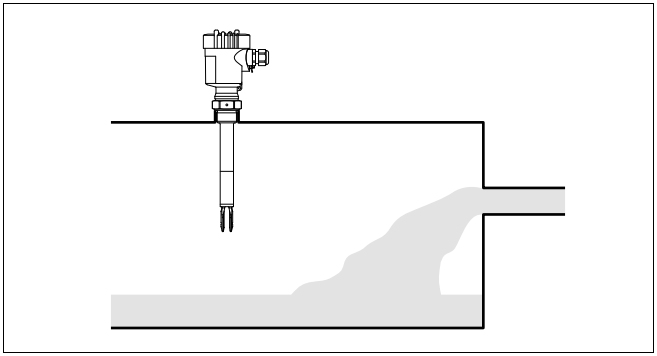

Fig. 8: Inflowing medium

Flows

To minimise flow resistance caused by the tuning fork, KSR-TF 633 should be mounted in such a way that the surfaces of the blades are parallel to the product movement.

Agitators

Agitators, equipment vibration, etc., can cause the level switch to be subjected to strong lateral forces. For this reason, do not use an overly long extension tube for KSR-TF 633, but check if you can mount a short level switch on the side of the vessel in horizontal position.

Extreme vibration caused by the process or the equipment, e. g. agitators or turbulence in the vessel can cause the extension tube of KSR-TF 633 to vibrate in resonance. This leads to increased stress on the upper weld joint. Should a longer tube version be necessary, you can provide a suitable support or guy directly above the tuning fork to secure the extension tube.

This measure applies particularly to applications in Ex areas category 1G or WHG. Make sure that the tube is not bent by this measure.

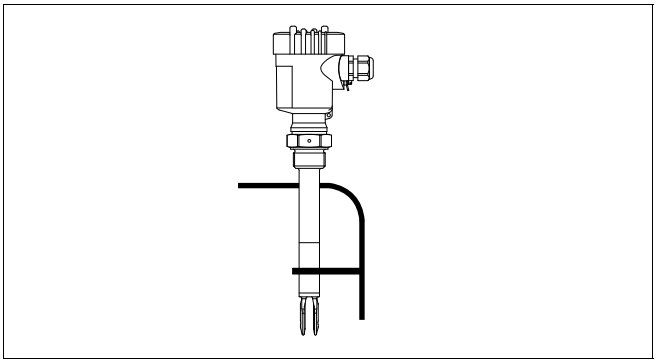

Fig. 9: Lateral straining of KSR-TF 633

5 Connecting to power supply

5.1 Preparing the connection

Note safety instructions

Always keep in mind the following safety instructions:

- Connect only in the complete absence of line voltage

Take note of safety instructions for Ex applications

In hazardous areas you should take note of the appropriate regulations, conformity and type approval certificates of the sensors and power supply units.

Select power supply

Connect the power supply according to the following diagrams. Take note of the general installation regulations. As a rule, connect KSR-TF 633 to vessel ground (PA), or in case of plastic vessels, to the next ground potential. On the side of the instrument housing there is a ground terminal between the cable entries. This connection serves to drain off electrostatic charges. In Ex applications, the installation regulations for hazardous areas must be given priority.

The data for power supply are stated in chapter "*Technical data*" in the "*Supplement*".

Selecting connection cable

KSR-TF 633 is connected with standard cable with round cross section. An outer cable diameter of 5 … 9 mm (0.2 … 0.35 in) ensures the seal effect of the cable gland.

If cable with a different diameter or wire cross section is used, exchange the seal or use an appropriate cable connection.

In hazardous areas, only use approved cable connections for KSR-TF 633.

Select connection cable for Ex applications

Take note of the corresponding installation regulations for Ex applications.

5.2 Connection procedure

With Ex instruments, the housing cover may only be opened if there is no explosive atmosphere present.

Proceed as follows:

1 Unscrew the housing cover

2 Loosen compression nut of the cable entry

3 Remove approx. 10 cm (4 in) of the cable mantle, strip approx. 1 cm (0.4 in) insulation from the ends of the individual wires
4 Insert the cable into the sensor through the cable entry
5 Open the terminals with a screwdriver
6 Insert the wire ends into the open terminals according to the wiring plan
7 Tighten the terminals with a screwdriver
8 Check the hold of the wires in the terminals by lightly pulling on them
9 Tighten the compression nut of the cable entry. The seal ring must completely encircle the cable
10 Screw the housing cover back on

The electrical connection is finished.

5.3 Wiring plan, single chamber housing

The following illustrations apply to the non-Ex as well as to the EEx d version.

Housing overview

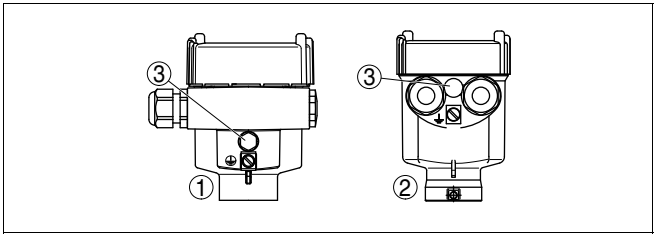

Fig. 10: Material versions, single chamber housing
1 Aluminium
2 Stainless steel
3 Filter element for pressure compensation

Electronics and connection compartment

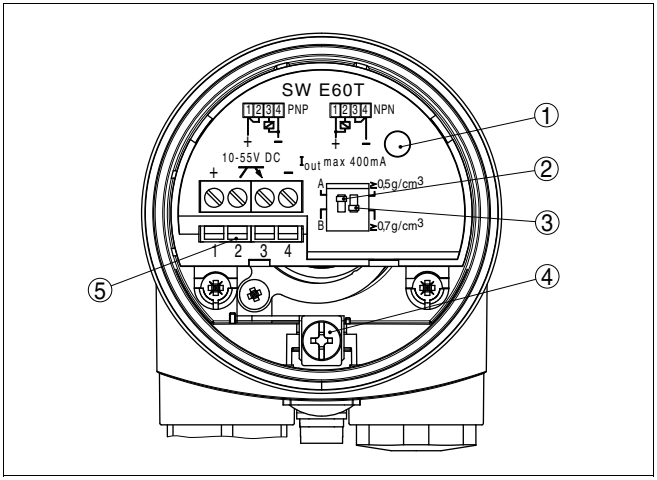

Fig. 11: Electronics and connection compartment, single chamber housing
1 Control lamp
2 DIL switch for mode adjustment
3 DIL switch for switching point adaptation
4 Ground terminal
5 Screwed terminals

Wiring plan

We recommend connecting KSR-TF 633 in such a way that the switching circuit is open when there is a level signal, line break or failure (safe condition).

The instrument is used to control relays, contactors, magnet valves, warning lights, horns as well as PLC inputs.

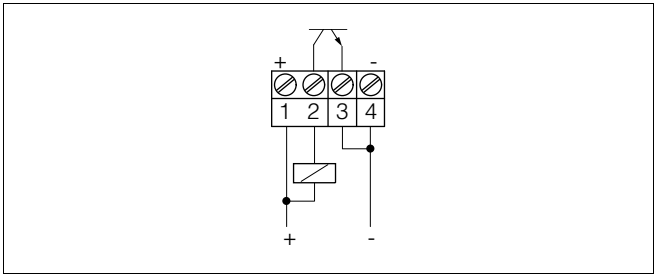

Fig. 12: NPN action

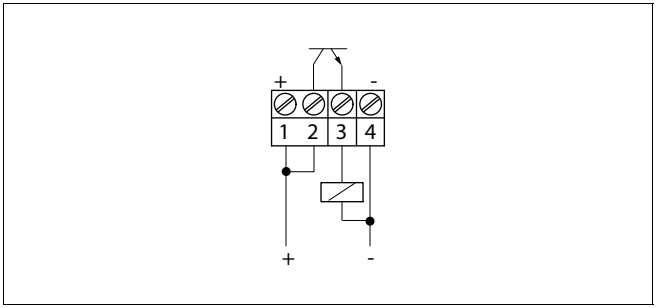

Fig. 13: PNP action

6 Set up

6.1 In general

The numbers in brackets refer to the following illustrations.

Function/Configuration

In the basic setting, products with a density >0.7 g/cm³ (0.025 lbs/in³) can be detected. For products with lower density, you have to set the switch to >0.5 g/cm³ (0.018 lbs/in³).

On the electronics module you will find the following indicating and adjustment elements:

- Signal lamp (1)
- DIL switch for mode adjustment - A/B (2)
- DIL switch for sensitivity adjustment (3)

Note:
For test purposes, immerse the tuning fork of KSR-TF 633 always in liquids. Do not test the function of KSR-TF 633 with the hand. This can damage the sensor.

6.2 Adjustment elements

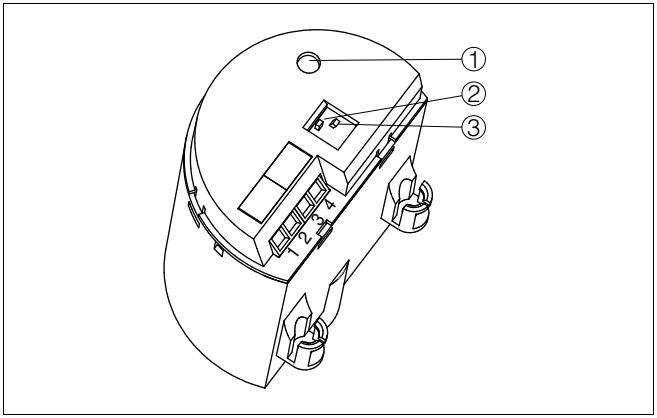

Fig. 14: Oscillator SWE60T - Transistor output
1 Signal lamp (LED)
2 DIL switch for mode adjustment
3 DIL switch for sensitivity adjustment

Signal lamp (1)

Control lamp (LED) for indication of the switching status.

- green = output conducts
- red = output blocks
- red (flashing) = failure

Mode adjustment (2)

With the mode adjustment (A/B) you can change the switching condition of the relay. You can set the required mode according to the "*Function chart*" (A - max. detection or overfill protection, B - min. detection or dry run protection).

Sensitivity adjustment (3)

With this DIL switch (3) you can set the switching point to liquids having a density between 0.5 and 0.7 g/cm^3 (0.018 and 0.025 lbs/in^3). With the basic setting, liquids with a density of >0.7 g/cm^3 (0.025 lbs/in^3) can be detected. In liquids with lower density, you must set the switch to >0.5 g/cm^3 (0.018 lbs/in^3). The specifications for the position of the switching point relate to water - density value 1 g/cm^3 (0.036 lbs/in^3). In products with a different density, the switching point will shift in the direction of the housing or tuning fork end depending on the density and type of installation.

Keep in mind that foams with a density >0.45 g/cm^3 (0.016 lbs/in^3) are detected by the sensor. This can cause faulty switchings particulary when used as dry run protection system.

6.3 Function chart

The following chart provides an overview of the switching conditions depending on the adjusted mode and level.

	Level	Switching status	Control lamp
Mode A Overflow protection		transistor conducts	 Green
Mode A Overflow protection		transistor blocks	 Red
Mode B Dry run protection		transistor conducts	 Green

	Level	Switching status	Control lamp
Mode B Dry run protection		transistor blocks	 Red
Failure of the supply voltage (mode A/B)	any	transistor blocks	○
Failure	any	transistor blocks	 flashes red

7 Maintenance and fault rectification

7.1 Maintenance

When used as directed in normal operation, KSR-TF 633 is completely maintenance free.

7.2 Fault rectification

Causes of malfunction

KSR-TF 633 offers maximum reliability. Nevertheless faults can occur during operation. These may be caused by the following, e.g.:

- Sensor
- Process
- Supply
- Signal processing

Fault clearance

The first measure to be taken is to check the output signal. In many cases, the causes can be determined this way and the faults rectified.

Checking the switching signal

? KSR-TF 633 signals "covered" when the vibrating element is not submerged (overfill protection)

? KSR-TF 633 signals "uncovered" when the vibrating element is submerged (dry run protection)

- Supply voltage too low

→ Check the power supply

- Electronics module defective

→ Press the mode switch (min./max.). If the instrument then changes the mode, the instrument may be mechanically damaged. Should the switching function in the correct mode still be faulty, return the instrument for repair.

→ Push the mode switch. If the instrument then does not change the mode, the oscillator may be defective. Exchange the oscillator.

→ Check if there is buildup on the vibrating element, and if so, remove it.

- Unfavourable installation location

→ Mount the instrument at a location in the vessel where no dead zones or air bubbles can form.

- Wrong mode selected

→ Set the correct mode on the mode switch (max.: overfill protection, min.: dry run protection). Wiring should be carried out according to the quiescent current principle.

? Signal lamp flashes red

- Electronics has detected a failure

→ Exchange instrument or return instrument for repair

? The signal lamp flashes alternately red and green

- instrument defective

→ Exchange instrument or return instrument for repair

7.3 Instrument repair

If a repair is necessary, please proceed as follows:

- Clean the instrument and pack it damage-proof
- Attach a description of the fault, the ambient conditions and measured product to the instrument
- If necessary, attach a safety sheet to the instrument
- Send the instrument to the address of the agency serving you, in Germany directly to the headquarters

8 Dismounting

8.1 Dismounting steps

Warning:
Before dismounting, be aware of dangerous process conditions such as e.g. pressure in the vessel, high temperatures, corrosive or toxic products etc.

Take note of chapters "*Mounting*" and "*Connecting to power supply*" and carry out the listed steps in reverse order.

With Ex instruments, the housing cover may only be opened if there is no explosive atmosphere present.

8.2 Disposal

The instrument consists of materials which can be recycled by specialised recycling companies. We use recyclable materials and have designed the electronics to be easily separable.

WEEE directive 2002/96/EG
This instrument is not subject to the WEEE directive 2002/96/EG and the respective national laws (in Germany, e.g. ElektroG). Pass the instrument directly on to a specialised recycling company and do not use the municipal collecting points. These may be used only for privately used products according to the WEEE directive.

Correct disposal avoids negative effects to persons and environment and ensures recycling of useful raw materials.

Materials: see chapter "*Technical data*"

If you cannot dispose of the instrument properly, please contact us about disposal methods or return.

9 Supplement

9.1 Technical data

General data

Material 316L corresponds to 1.4404 or 1.4435

Materials, wetted parts	
– Process fitting - thread	316L, Hastelloy C4 (2.4602)
– Process fitting - flange	316L, 316L with Hastelloy C4 plated, 316L with ECTFE coated, 316L with PFA coated
– Process seal	Klingersil C-4400 (with threaded versions)
– Tuning fork	316L, Hastelloy C4 (2.4610)
– Extension tube ø 21.3 mm (0.84 in)	316L, Hastelloy C4 (2.4610), 316L with ECTFE coating, 316L with PFA coating
Materials, non-wetted parts	
– Housing	Aluminium die-casting powder coated, 316L
– Seal between housing and housing cover	NBR (stainless steel housing), silicone (Aluminium housing)
– Ground terminal	316L
– Temperature adapter (optional)	316L
– Gas-tight leadthrough (optional)	316L/glass
Lengths	
– 316L, Hastelloy C4 (2.4610)	80 … 6000 mm (3.15 … 236.22 in)
– 316L, ECTFE coated	80 … 3000 mm (3.15 … 118.11 in)
– 316L, PFA coated	80 … 3000 mm (3.15 … 118.11 in)
Weights	
– Aluminium housing	1170 g (41 oz)
– Stainless steel housing	1530 g (54 oz)
– Tube extension	approx. 920 g/m (10 oz/ft)
Layer thickness - coatings	
– ECTFE	approx. 0.5 mm (0.02 in)
– PFA	approx. 0.5 mm (0.02 in)
Surface quality	
– Standard	R_a approx. 3 µm (1.18^{-4} in)
– hygienic version (3A)	R_a <0.8 µm (<3.15^{-5} in)
– hygienic version (3A)	R_a <0.3 µm (1.18^{-5} in)

Process fittings	
– Thread	G¾ A, ¾ NPT, G1 A, 1 NPT
– Flanges	DIN from DN 25, ANSI from 1"
– hygienic fittings	Bolting DN 40 PN 40, Tri-Clamp 1", Tri-Clamp 1½" PN 10, conus DN 25 PN 40, Tuchenhagen Varivent DN 50 PN 10
Gas-tight leadthrough (optional)	
– leakage rate	$<10^{-6}$ mbar l/s
– Pressure resistance	PN 64
– hygienic fittings	Bolting DN 40 PN 40, Tri-Clamp 1", Tri-Clamp 1½" PN 10, conus DN 25 PN 40, Tuchenhagen Varivent DN 50 PN 10

Output variable

Output	floating transistor output, overload and permanently shortcircuit proof
Load current	max. 400 mA
Voltage loss	max. 1 V
Turn-on voltage	max. 55 V DC
Blocking current	<10 µA
Modes (adjustable)	
– A	Max. detection or overflow/overfill protection
– B	Min. detection or dry run protection

Measuring accuracy

Deviation	±1 mm (±0.04 in)

Influence of the process temperature on the switching point

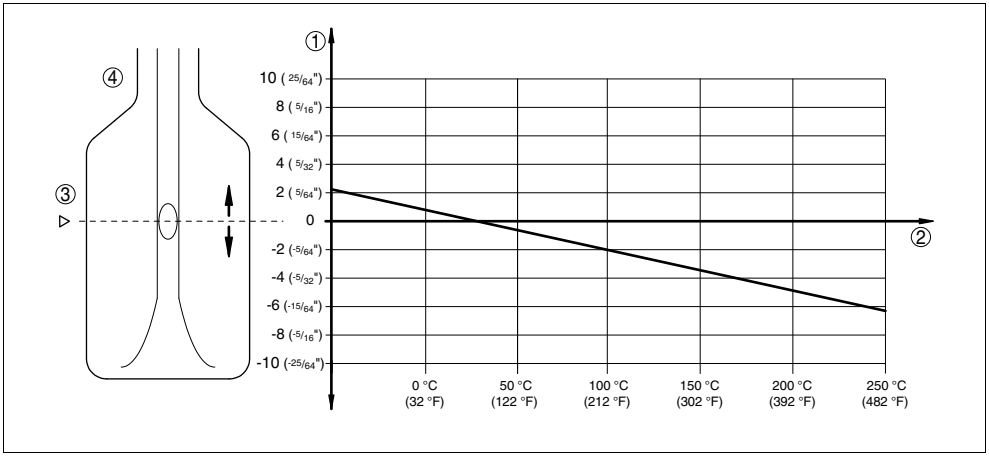

Fig. 23: Influence of the process temperature on the switching point
1 Shifting of the switching point in mm (in)
2 Process temperature in °C (°F)
3 Switching point at reference conditions (notch)
4 Tuning fork

Influence of the product density on the switching point

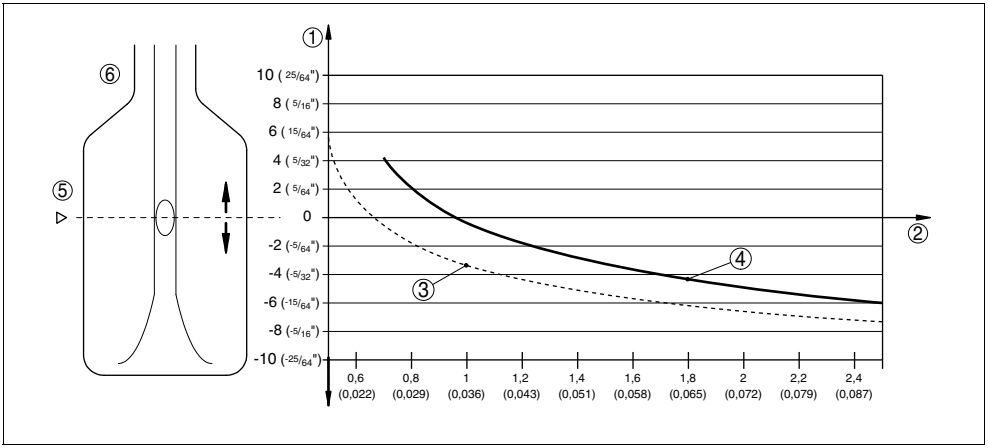

Fig. 24: Influence of the product density on the switching point
1 Shifting of the switching point in mm (in)
2 Product density in g/cm³ (lb/in³)
3 Switch position 0.5 g/cm³ (corresponds to 0.018 lb/in³)
4 Switch position 0.7 g/cm³ (corresponds to 0.025 lb/in³)
5 Switching point at reference conditions (notch)
6 Tuning fork

Influence of the process pressure to the switching point

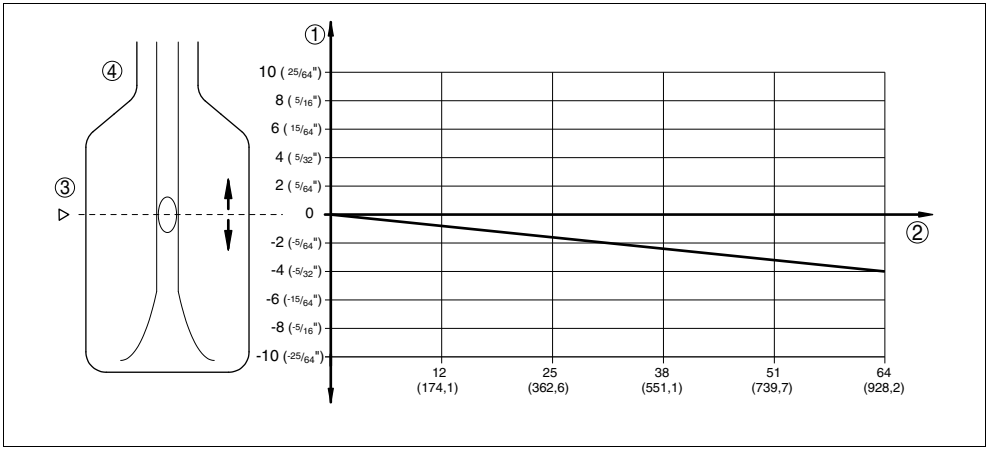

Fig. 25: Influence of the process pressure to the switching point
1 Shifting of the switching point in mm (in)
2 Process pressure in bar (psi)
3 Switching point at reference conditions (notch)
4 Tuning fork

Repeatability	0.1 mm (0.004 in)
Hysteresis	approx. 2 mm (0.08 in) with vertical installation
Switching delay	approx. 500 ms (on/off)
Frequency	approx. 1200 Hz

Ambient conditions

Ambient temperature on the housing	-40 … +70 °C (-40 … +158 °F)
Storage and transport temperature	-40 … +80 °C (-40 … +176 °F)

Process conditions

Parameter	Limit level of liquids
Process pressure	-1 … 64 bar (-14.5 … 938 psi) depending on the process fitting, e.g. flange (see following diagrams)
KSR-TF 633 of 316L/Hastelloy C4 (2.4610)	-50 … +150 °C (-58 … +302 °F)

Process temperature (thread or flange temperature) with temperature adapter (option)

- KSR-TF 633 of 316L/Hastelloy C4 -50 … +250 °C (-58 … +482 °F)
- KSR-TF 633 with ECTFE coating -50 … +150 °C (-58 … +302 °F)
- KSR-TF 633 with PFA coating -50 … +150 °C (-58 … +302 °F)

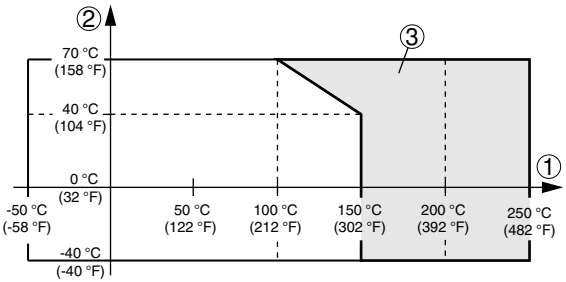

Fig. 26: Ambient temperature - Process temperature
1 Process temperature in °C (°F)
2 Ambient temperature in °C (°F)
3 Temperature range with temperature adapter

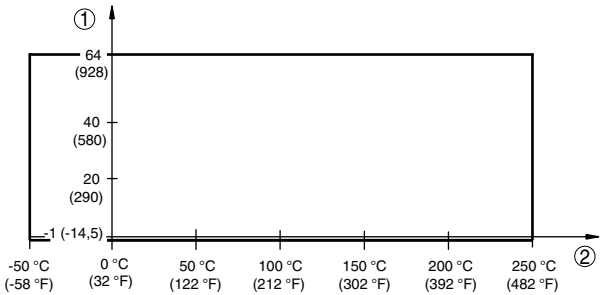

Fig. 27: Process temperature - Process pressure with switch position 0.7 g/cm³ (mode switch)
1 Process pressure in bar (psi)
2 Process temperature in °C (°F)

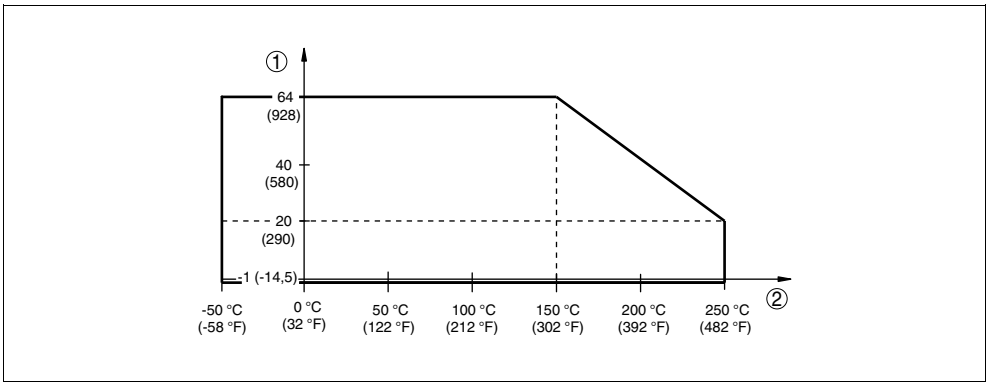

Fig. 28: Process temperature - Process pressure with switch position 0.5 g/cm³ (mode switch)
1 Process pressure in bar (psi)
2 Process temperature in °C (°F)

Viscosity - dynamic	0.1 … 10,000 mPa s (requirement: with density 1)
Density	0.7 … 2.5 g/cm³ (0.025 … 0.09 lbs/in³); 0.5 … 2.5 g/cm³ (0.018 … 0.09 lbs/in³) by switching over

Electromechanical data

Cable entry/plug[1)]

– Single chamber housing
- 1x cable entry M20x1.5 (cable-ø 5 … 9 mm), 1x blind stopper M20x1.5

or:

- 1x closing cap ½ NPT, 1x blind plug ½ NPT

or:

- 1x plug (depending on the version), 1x blind plug M20x1.5

Screw terminals: for wire cross-section up to 1.5 mm² (0.0023 in²)

Adjustment elements

Mode switch

– A	Max. detection or overflow/overfill protection
– B	Min. detection or dry run protection

[1)] Depending on the version M12x1, according to DIN 43650, Harting, Amphenol-Tuchel, 7/8" FF.

Density switch

– 0.5	0.5 … 2.5 g/cm³ (0.018 … 0.9 oz/in³)
– 0.7	0.7 … 2.5 g/cm³ (0.025 … 0.9 oz/in³)

Voltage supply

Supply voltage	10 … 55 V DC
Power consumption	max. 0.5 W

Electrical protective measures

Protection	IP 66/IP 67
Overvoltage category	III
Protection class	II

Functional safety (SIL)

Functional safety according to IEC 61508/IEC 61511

– Single channel architecture (1oo1 D)	up to SIL2
– Multiple channel architecture	see supplementary instructions manual "*Safety Manual (SIL)*"

Approvals[2)]

Overfill protection according to WHG

ATEX II 1G 1/2G, 2G EEx ia IIC T6

ATEX II 1/2G, 2G EEx d IIC T6[3)]

FM (NI) CL I, DIV 2, GP ABCD

FM (XP) CL I, DIV 1, GP ABCD (DIP) CL II, III, DIV 1, GP EFG[4)]

Ship approvals

[2)] Deviating data in Ex applications: see separate safety instructions.
[3)] Only with Aluminium housing.
[4)] Only with Aluminium housing.

9.2 Dimensions

KSR-TF 633

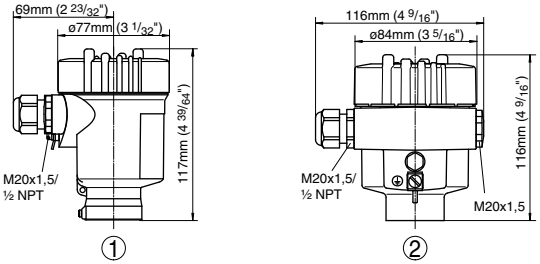

Fig. 29: Housing versions
1 Stainless steel housing
2 Aluminium housing

KSR-TF 633

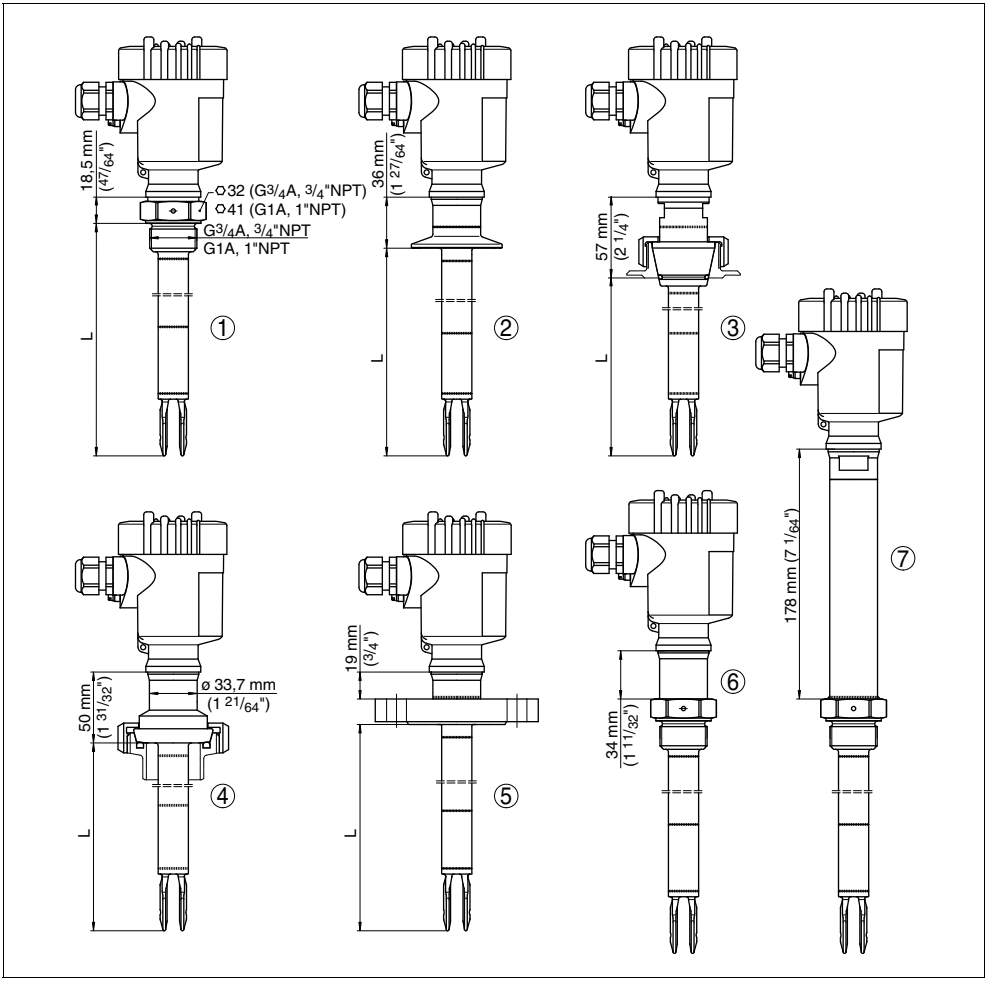

Fig. 30: KSR-TF 633

1 Thread
2 Tri-Clamp
3 Cone DN 25
4 Bolting DN 40
5 Flange
6 Gas-tight leadthrough
7 Temperature adapter
L = Sensor length, see chapter "Technical data"

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